



Gadgets for the Management of Stored Product Insects

K. Haripriya*¹, M. Saranya² and R. Sangavi³

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^{1,2} Department of Agricultural Entomology, TNAU, Coimbatore- 641 003

³ Department of Agricultural Entomology, Navsari Agricultural University, Navsari- 396 450.

Corresponding author: akharipriya@gmail.com

Introduction

Among biotic and abiotic factors which affects grains in storage, insects play a major role in the deterioration of food grains causing both quantitative and qualitative losses. Often the presence of the insects in store houses are felt only when they are hovering and flying around, by which time enormous loss and population build-up of insects might have occurred. It is well proved that no granaries can be filled with grains without insects as the harvested produce contain egg (or) larvae (or) pupae in them because of field carryover infestation which cannot be avoided in developing countries like India. So what is required is simple technologies for timely detection of insects in the stored produce and thereby plan timely control measures. Many devices have been developed for stored grain insect some of which are popularly used across the country in households / farms / godowns. The devices can be used for both monitoring and mass trapping of stored grain insects. It is important to note that even a single live insect presence in food grain cannot be tolerated as they build up and cause enormous loss in storage due to their high reproductive rate.

1. TNAU Insect probe trap

- Use of trap is relatively a new method of detecting, trapping insects in stored grains.
- Basic components of a TNAU probe trap consist of three important parts: A main tube, insect trapping tube and a detachable cone at the bottom. Equispaced perforations of 2 mm diameter are made in the main tube.

Method of working:

- The insect trap has to be kept in the grain like rice, wheat etc., vertically with the white plastic cone downside as shown the figure. The top red cap must be with the level of the grain. Insects will move towards air in the main tube and enter through the hole.
- Once the insect enters the hole it falls down into the detachable white cone at the bottom. Then there is no way to escape and the insects are trapped forever. The white detachable cone can be unscrewed once in a week and the insects can be destroyed.
- No chemicals; No side effects and No maintenance cost.



2. TNAU Pit fall trap

Pitfall traps are used for capturing insects active on grain surface and in other layers of grain. (Monitoring and mass trapping tool).

Standard Model

- Standard model of pitfall trap has 2 parts, perforated lid (2 mm (or) 3 mm) and a cone shaped bottom portion.
- Application of special coating with sticky material on the inner side of cone to hold trapped insects is necessary
- This procedure is tedious.

TNAU Model

- TNAU model has perforated lid, cone shaped bottom which tapers into a funnel shaped trapping tube.
- Hence sticky coating is dispensed with
- Commercial model is in plastic, simple and economical (cost per trap is Rs. 25/- only).
- Easy to handle.

TNAU Two-in-one model trap

- Probe trap containing the components namely the perforated tube, pitfall mechanism, a collection tube and the cone shaped pitfall trap with a perforated lid and the bottom tapering cone were combined as a single unit.
- Combination of probe and pitfall increase the trapping efficiency of insects. Best suited for pulse beetles as they are seen only on grain surface wandering here and there. It does not require tedious procedures like coating the inner surface of pitfall cone with sticky materials before trapping to hold pulse beetles.
- Beetles are captured alive in this trap, which may facilitate release of pheromone and there by attract more insects.

4. TNAU Indicator device

- It consists of a cone shaped perforated cup (3mm perforation) with a lid at the top. The cup is fixed at the bottom with a container and circular dish, which are to be smeared with sticky material like vaseline.
- Farmers, before storing their pulses, should take 200 g of pulses to be stored and put them in the cup. When the field carried over beetles start emerging, due to their wandering behaviour, they enter the perforations and get slipped off and fall into the trapping portions. As they stick on to the sticky materials, farmers can easily locate the beetles and can take out the bulk-stored pulses for sun drying. The device with 2mm perforations can be used for cereals.
- This will help in eliminating the initial population, which acts as the major source for further build up. Thus, timely detection will help the farmers to preserve their valuable pulses during storage. The device is being popularised.

**5. TNAU Automatic insect removal bin**

- TNAU insect removal bin can remove insect automatically. The structure has 4 major parts namely outer container, inner perforated container, collection vessel and the lid. The model exploits wandering behaviour of stored product insects as well as the movement of these insects towards well aerated regions. The grains are held in the specially designed inner perforated container.
- The space between inner and outer container provides good aeration for the insects. Insects, while wandering, enter the perforation to reach the aerated part and while doing so, get slipped off and fall into the collection vessel through a pitfall mechanism provided in the collection vessel. In order to quickly collect the insects, as and when they emerge from grains, perforated (2 mm) rods are fixed in the inner container.
- The container will be useful for storing rice, wheat, broken pulses, coriander etc. The insects such as rice weevil, lesser grain borer, red flour beetle, saw toothed beetle, which are commonly found attacking stored grains can be removed automatically by storing grains in this container. Within a very short period of 10 days a majority of the insects (more than 90 per cent) can be removed from the grains. The containers are available in 2 kg, 5 kg, 25 kg, 100 kg and 500 kg capacities.

6. TNAU UV – Light trap for ware house

- The UV light trap mainly consists of a ultra-violet source (4 W germicidal lamp). The lamp produces ultra-violet rays of peak emission around 250 nano meter. The light is fitted at the centre of a funnel of 310 mm diameter at the top and 35 mm diameter at the bottom.
- The bottom end of the funnel is attached with a transparent plastic container for collecting the trapped insects. To hang the unit at desired points, three hooks have been provided at the periphery of the funnel. The unit is also provided with a tripod stand.
- The UV light trap can be placed in food grain storage godowns at 1.5 m above ground level, preferably in places around warehouse corners, as it has been observed that the insect tends to move towards these places during the evening hours. The trap can be operated during the night hours.
- The light trap attracts stored product insects of paddy like lesser grain borer, *Rhyzopertha dominica*, red flour beetle, *Tribolium castaneum* and saw toothed beetle, *Oryzaephilus surinamensis* in large numbers. Psocids which are of great nuisance in godowns are also attracted in large numbers. Normally 2 numbers of UV light trap per 60 x 20 m (L x B) godown with 5 m height is suggested.
- The trap is ideal for use in godowns meant for long term storage of grains, whenever infested stocks arrive in godowns and during post fumigation periods to trap the resistant strains and left over insects to prevent build-up of the pest populations. In godowns of frequent transactions the trap can be used for monitoring.

**7. TNAU Stored grain insect pest management kit**

- A “KIT” named as TNAU-Stored Grain Insect Pest Management Kit contains prototypes of all the devices along with a CD-ROM about the devices and how to use them. This kit will be of great use in popularization of the technologies across the country.
- The kit will be an ideal “hands – on training” tool for Education, Extension centers (KVK, Plant clinic, save grain centres) and also for private ware housing. This TNAU kit is the first of its kind in the world.

8. TNAU Insect egg remover (Patent No. 198434):

- The gadget has outer container and an inner perforated container with a rotating rod having fixed with plastic brushes on all sides. The seeds with eggs are packed in the perforated container and the rod is rotated. Due to the splashing action of the brush in rotating rod, the eggs get crushed and thus the damage is prevented.
- The treatment does not affect the germination of seeds. This machine, which has the capacity of cleaning efficiency around 200 Kg/hr with 1 HP motor, can crush the eggs present in the grains, when the grains flow through the machine to a considerable extent so that further development can be prevented.

9. TNAU- Stack probe trap (Patent No. 284727):

- TNAU- stack probe trap is a device to monitor insects in bag stacks in warehouse without bait.
- It is made of plastic (PVC) comprises a main hollow tube having a diameter in the range of 1.8 to 2.0 cm with equi-spaced perforation in the range of 1.8 to 2 mm on its upper portion with a bend at one end which ends in a transparent collection unit to collect the insects falling down from the bend, the other end of main tube being closed.
- The device will be useful to validate the effect of fumigation by using it immediately after fumigation, in different layers of the fumigated stacks.

10. Entoleter:

- Entoleter is used in milling process to minimize infestation in end product. Its application is simple containing a horizontal disc with vertical pins assembled concentrically in a closed container. When flour passes through this disc which is rotating on high speed of approximately 2500 rpm, flour particle collide with pins.
- Entoleter is the ideal machine for flour mills and grain processing plant to destroy all forms of insects and all stages of growth contained in cereal grains and flours. The Entoleters (Scourer-Aspirator) is standard grain cleaning equipment in flour mills around the world.
- Entoleters have unique centrifugal impact processing and selective grain cleaning system advantages. A machine used to disinfest cereals and other foods. The material is fed to the centre of a high-speed rotating disc carrying studs so that it is thrown against the studs; the impact kills any insects and destroys their eggs.